VERIFICATION OF TRANSLATION

I. **Hye-Jin CHO of 1110-705, Buyung APT., Eunbit Maeul, Hwajeong-1 dong, Dukyang-gu, Goyang-si, Gyeonggi-do,** declare that I have a thorough knowledge of the Korean and English languages, and the writings contained in the following pages are correct English translation of the specification and claims of Korean Patent Application No. 1999-43508.

This 21st day of March 2005.

By:

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[ABSTRACT]

A data architecture (or structure) relates to a VCT among a plurality of tables corresponding to a PSIP of an ATSC standard for digital broadcasting, which includes an identification information for identifying active channels and inactive channels in the VCT, thereby transmitting the VCT from a transmitting end. Thus, a DTV receiver may be able to identify the active channels and the inactive channels by simply parsing the VCT, thereby allowing the channels to be switched quickly. In addition, the inactive channels may be skipped by using channel-up and channel-down keys, thereby enabling viewers to surf the channels and skip the inactive channels without having to view non-broadcasted black screens.

[TYPICAL DRAWING]

FIG. 3

[INDEX]

ATSC, PSIP, VCT

[SPECIFICATION]

[TITLE OF THE INVENTION]

DATA ARCHITECHTURE OF VCT AND METHOD

FOR TRANSMITTING/RECEIVING SERVICE INFORMATION

[BRIEF DESCRIPTION OF THE DRAWINGS]

FIG. 1 illustrates a ground wave VCT bit stream syntax structure.

FIG. 2 illustrates an example of scheduled broadcasting using 4 virtual channels from a broadcast station.

1

FIG. 3 illustrates a ground wave VCT bit stream syntax structure according to the present invention.

FIG. 4 illustrates a cable VCT bit stream syntax structure according to the present invention.

5

[DETAILED DESCRIPTION OF THE INVENTION]

[OBJECT OF THE INVENTION]

[FIELD OF THE INVENTION AND DISCUSSION OF THE RELATED ART]

The present invention relates to an Advanced Television Systems Committee

10 (ATSC), which is provided as a digital television standard, of a Program and System Information Protocol (PSIP). More particularly, the present invention relates to a data architecture of a Virtual Channel Table (VCT) and a method for transmitting/receiving service information. The VCT is parsed in order to identify active channels that are currently being broadcasted and inactive channels that are not being broadcasted.

15 In general, an Electronic Program Guide (EPG) and System Information (SI) are collectively defined as a PSIP. The PSIP is an ATSC standard for digital broadcasting through ground wave and cable. By a Moving Picture Experts Group-2 (MPEG-2; an ISO/IEC 13818-1 system) method, the encoded messages are parsed and newly defined in order to provide diverse information related to a specific program.

20 (Dec. 1997, document A/65)

More specifically, the PSIP transmits and receives A/V data created in MPEG-2 video and AC-3 audio formats. The PSIP is formed of a plurality of tables so that channel information of each broadcast station and program information for each channel can be transmitted. In addition, the PSIP may support a main function of

2

selecting a channel and providing A/V services of a desired broadcast program, and additional functions such as providing EPG (*i.e.*, program information services) for the broadcast program.

At this point, channel information for selecting channels and information, such as packet identification (PID) numbers, for receiving the A/V data are transmitted through a VCT. Moreover, EPG information for broadcast programs of each channel is transmitted through an Event Information Table (EIT). Furthermore, the PSIP includes a System Time Table (STT) for transmitting timing information, a Rating Region Table (RRT) for transmitting information on region and consultation organizations for program ratings, an Extended Text Table (ETT) for providing additional description of a specific channel and broadcast program, and a Master Guide Table (MGT) for managing the versions of the above-mentioned tables and the PID. The tables included in the PSIP are transmitted to a data structure (or architecture) referred to as a "section".

More specifically, each of the above-described tables has a basic unit called a "section", and a combination of one or more sections forms a table. The VCT may be divided into 256 sections. Furthermore, each section may include a plurality of virtual channel information. However, a single set of virtual channel information is not divided into two (2) or more sections.

FIG. 1 illustrates a bit stream syntax of a general ground wave VCT described in document "A/65". The general VCT includes various information such as transport stream ID, channel number (major, minor), short channel name, carrier frequency, program number. Additional information is included in the VCT descriptor.

3

Referring to FIG. 1, the VCT has a table identifier (table_id) of 0xC8, and the PID for the VCT is 0x1FFB. A version_number represents the version value of the VCT, a section_number represents the number of the current section, and a last_section_number represents the number of the last section of a complete VCT. Also, a num_channels_in_section designates the total number of virtual channels existing in the VCT section. In addition, a short_name included in the FOR statement (shown in FIG. 1) is the name of the virtual channel, and a major_channel_number represents a 'major' channel number associated with the virtual channel defined in the statement. Each of the virtual channel numbers should be connected to a major and minor channel number. Here, the minor channel number is applied as a user reference number for the corresponding virtual channel.

A program_number is for connecting the virtual channel having the MPEG-2 program association table (PAT) and program map table (PMT) defined therein. The program_number is identical to the program number included in the PAT/PMT. More specifically, the PAT describes the program elements for each program number, and the PMT indicates the PID of the transport packet being transmitted. The PMT describes a PID list of the transport packet having program identification numbers and individual bit sequences of video and audio data and also describes subsidiary information.

A source_id represents a program source connected to the corresponding virtual channel. More specifically, a source refers to a specific source such as a video image, text, data or sound. A source_id value has a unique value within the transport stream which transmits the VCT. A descriptor_length represents the total length of the descriptor of the corresponding virtual channel, and an additional_descriptor_length represents the total length of all of the accompanying VCT descriptors. More

4

specifically, the VCT transmits and/or receives data for each virtual channel through the FOR statement.

FIG. 2 illustrates an example of scheduled broadcasting using four (4) virtual channels from a broadcast station. In other words, an assumption is made that a broadcast station provides scheduled broadcasting through four (4) different virtual channels, *e.g.*, 51-1, 51-2, 51-3, and 51-8, as shown in FIG. 2, and that the VCT is constructed of one section. If the current time is 20:15, the current time is transmitted to the STT. The virtual channels that are broadcasting programs on the current time 20:15 are 51-1 and 51-3. Thus, virtual channels 51-1 and 51-3 will be defined as active channels.

Meanwhile, channel 51-2 does not broadcast any programs on the current time 20:15, but programs are scheduled to be broadcasted starting from 0:00. Similarly, channel 51-8 is also scheduled to broadcast programs starting from 06:00 of the following day. Therefore, virtual channels that do not broadcast any programs during the current time, yet scheduled to broadcast programs at a later time, will be defined as inactive channels. In other words, all of the channels may appear or disappear based upon a specific time period.

According to the PSIP standard, the active channel must be included in the VCT (a forced requirement), and the inactive channels may be included for EPG services (recommended by broadcast stations, and not a forced requirement). Therefore, at a current time 20:15, information on channels 51-1, 51-2, 51-3, and 51-8 may be included in the VCT and transmitted, and a DTV receiver receives such VCT, thereby providing channel select information to the viewers.

However, in the VCT syntax of A/65, shown in FIG. 1, the DTV receiver parses

the VCT, and so the DTV receiver is unable to identify the active channels (*e.g.*, channels 51-1 and 51-3) and the inactive channels (*e.g.*, channels 51-2 and 51-8). Therefore, due to the inactive channel information transmitted from the broadcast station for the EPG services, the viewer is provided with only a black screen (*e.g.*, broadcast program cannot be viewed and a message stating "Service cannot be provided" is displayed on the black OSD instead). This instance refers to when the user adjusts the receiver by using channel-up and channel-down keys, and when 51-1 is switched to its subsequent channel 51-2, the viewer can only view a black screen from this channel, since channel 51-2 is an inactive channel. As digital broadcasting becomes extensively provided to the users, and as a wide range of virtual channels are being broadcasted, such problems of viewing black screen may cause serious inconvenience to many viewers.

An object of the present invention devised to solve the foregoing problems lies on providing a data architecture of VCT and a method for transmitting/receiving service information, in which identification information in a VCT bit stream syntax identifying inactive channels, thereby enabling active channels and inactive channels to be identified when the DTV receiver parses the VCT.

[TECHNICAL TASKS TO BE ACHIEVED BY THE INVENTION]

To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, in a data structure of a Virtual Channel Table (VCT) among a plurality of tables corresponding to programs defined for digital broadcasting and a PSIP, the data structure of the VCT includes an identification information for identifying active channels and inactive channels in a bit stream syntax of the VCT.

Furthermore, the identification information may have a program_number field value '0' in the VCT, which indicates that a specific channel is an inactive channel. The identification information may also have a number_elements field value '0' in the service_location_descriptor in the VCT, which indicates that a specific channel is an

5   inactive channel.

Additionally, the identification information may not include the service_location_descriptor within the VCT, when a specific channel is an inactive channel. Moreover, the identification information may allocate at least one bit of a reserved field in the VCT so as to indicate that a specific channel is an inactive channel.

10   In another aspect of the present invention, a method for transmitting and/or receiving service information includes a transmitting step including an identification information for identifying active channels and inactive channels in a bit stream syntax of a Virtual Channel Table (VCT) within programs defined for digital broadcasting and a Program and System Information Protocol (PSIP), and transmitting the VCT

15   including the identification information, and a receiving step parsing the transmitted VCT and determining whether a channel currently being received is an active channel or an inactive channel based on the identification information defined in the VCT.

Therefore, in the PSIP standard, by including an identification information, which can identify the active channels and the inactive channels in the syntax as a VCT

20   field, only the channels that are currently broadcasting programs can be quickly provided to the viewers.

[PREFERRED EMBODIMENTS OF THE INVENTION]

A technical system of the present invention will be described in detail with reference to the attached drawings.

7

According to the present invention, a bit stream syntax of a VCT is modified so as to enable the DTV receiver to parse the VCT and identify active channels and inactive channels. More specifically, for example, although channels 51-2 and 51-8 are not broadcasting any programs on the current time, the DTV receiver is capable determining that channels 51-2 and 51-8 will be broadcasting programs at a later scheduled time. In the embodiment of the present invention, the program_number field, the service_location_descriptor, and a reserved field are used as identification information for identifying inactive channels.

FIG. 3 illustrates a ground wave VCT bit stream syntax structure according to the present invention. Here, the value of the program_number field of an inactive channel is determined as '0'. Since audio and video data are absent in the service_location_descriptor, either the value of the number_elements field is determined as '0', or, in case the channel is inactive, the service_location_descriptor is not transmitted at all. More specifically, in view of the DTV, the service_location _descriptor, which must be included in the VCT, only corresponds to the active channels. The service_location_descriptor does not necessarily have to be transmitted to the inactive channels.

In addition, in order to provide a more accurate identification of the inactive channels, 1 bit of the reserved field (*e.g.*, a 6-bit field) is allocated for defining a flag, which indicates "inactive channel." In the embodiment of the present invention, 1 bit of the reserved field, which exists between the hidden field and the service_type field within the FOR statement, is used as the flag (*i.e.*, field) indicating "inactive channel". For example, in a normal state, the inactive channel flag indicates '1' (in the reserved field), and when the channel is inactive, the inactive channel flag indicates '0'.

8

The three (3) elements mentioned above may be included in A/65 as forced requirements.   Here, either all of the three (3) elements may be included, or at least any one of the three elements may be included in A/65.

As described above, since information of the inactive channels is included in the VCT, the DTV receiver is capable of identifying the virtual channel that is currently being received as an inactive channel or an active channel by simply parsing the VCT.   For example, when the program_number value within the VCT is '0', and a inactive channel field, which is allocated and defined from a reserved field, is '0', and when the service_location_descriptor is not transmitted, the DTV receiver determines the major _channel_number and the minor_channel_number as an inactive channel, which are defined within the bit stream syntax of the VCT that is currently being transmitted.

At this point, when the inactive channel is detected from the above-described process, the DTV receiver can skip the inactive channel by changing the channels using the channel-up and channel-down keys.   Meanwhile, the method for distinguishing the inactive channels according to the present invention may also be applied to a cable VCT, which is shown in FIG. 4.

[ADVANTAGES OF THE INVENTION]

According to the present invention, the data architecture of VCT and the method for transmitting/receiving service information have following advantages.   By including identification information, which enables inactive channels to be identified, in the VCT from a transmitter, and transmitting the identification information, the DTV receiver is capable of identifying the virtual channel that is currently being received as an inactive channel or an active channel by simply parsing the VCT, thereby allowing a

quicker change in channels. In addition, when changing the channels, since the channels may be skipped by using the channel-up and channel-down keys, the viewers are able to surf the channels without having to view the black screens of the non-broadcasting channels. Finally, since broadcast stations can transmit services regardless of the inactive channels, more abundant EPG services may be provided.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the inventions. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. In a data structure of a Virtual Channel Table (VCT) among a plurality of tables corresponding to programs defined for digital broadcasting and a Program and System Information Protocol (PSIP), the data structure of the VCT comprising:

5　　　　an identification information for identifying active channels and inactive channels in a bit stream syntax of the VCT.

2. The data structure of claim 1, wherein the identification information has a program_number field value '0' in the VCT, which indicates that a specific channel is

10　　an inactive channel.

3. The data structure of claim 1, wherein the identification information has a number_elements field value '0' in the service_location_descriptor in the VCT, which indicates that a specific channel is an inactive channel.

15

4. The data structure of claim 1, wherein, the identification information does not include the service_location_descriptor within the VCT, when a specific channel is an inactive channel.

20　　5. The data structure of claim 1, wherein the identification information allocates at least one bit of a reserved field in the VCT, so as to indicate that a specific channel is an inactive channel.

6. The data structure of claim 5, wherein the identification information is the

11

reserved field of the VCT, the reserved field being included in a FOR statement of a bit stream syntax of the VCT.

7. A method for transmitting and receiving service information, the method comprising:

a transmitting step including an identification information for identifying active channels and inactive channels in a bit stream syntax of a Virtual Channel Table (VCT) within programs defined for digital broadcasting and a Program and System Information Protocol (PSIP), and transmitting the VCT including the identification information; and

a receiving step parsing the transmitted VCT and determining whether a channel currently being received is an active channel or an inactive channel based on the identification information defined in the VCT.

8. The method of claim 7, wherein, when the received channel is an inactive channel, the transmitting step determines a program_number value within the VCT as '0', allocates at least one bit of a reserved field and determines the allocated bit as '0', and does not transmit a service_location_descriptor.

9. The method of claim 8, wherein, when the program_number value within the parsed VCT bit stream syntax and the reserved field value allocated as an inactive channel field are determined as '0', and when the service_location_descriptor is not transmitted, the receiving step determines the currently received channel as an inactive channel.